

BOOK OF ABSTRACTS

FIRST INDIAN PEARL CONGRESS
and
EXPOSITION



CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

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Pearl Culture – A New Hope for Aquaculture in the 21st Century

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Mankind has always been attracted to pearls, the most mesmerizing and noble of gems. The history of the cultured pearl has been traced from the time of its invention. The famous fisheries for Indian oriental pearls in the Palk Bay, Gulf of Mannar and the Gulf of Kutch have been described. The pioneering work of James Hornell on pearl fisheries and culture and the subsequent advances made in pearl culture in Indian marine pearl oysters and freshwater mussels by CMFRI and CIFA are outlined. The future course of action for producing value added, internationally competitive pearls are provided.

From the beginning of recorded history, the pearl has been extolled as a metaphor of life itself, for virtue and love, wisdom and justice, spirituality and righteousness. The allure of the pearl, the most ancient and most precious of gems, is timeless and universal for humans. The pearl has a history more ancient, more fascinating and more regal than any other gem. History's most illustrious men and women chose to be adorned in pearls for the images they wished to leave to posterity. The world's greatest literature, like the Rig Veda, the Gita, the Bible, the Koran, the Talmud and Shakespeare have all extolled the value and virtue of the pearl. In the modern world fine pearls continue to evoke a sense of awe and wonder; perhaps even more so because of our understanding of how the pearl is actually created.

While the Chinese experimented with pearl cultivation for hundreds of years, it was not until the end of the 19th century that real progress was made. An Australian named William Saville-Kent and three Japanese inventors – a biologist named Tokichi Nishikawa, a carpenter named Tatsuhei Mise, and the son of a noodle maker, Kokichi Mikimoto – discovered the techniques for culturing pearls. While the name Mikimoto is the first that comes to mind when cultured pearls are mentioned, the Australian Saville-Kent is now believed to deserve the credit for the original development of the technique. His technique involved taking a piece of mantle tissue from one oyster and implanting it in another. His technique was perfected and patented by Mise and Nishikawa, and later purchased by Mikimoto in 1916. By the 1920, Mikimoto and his cultured pearl changed the pearl market forever.

The history of the Indian pearl is not very different. Admired throughout the world as the finest of 'Oriental pearls' they fetched a price beyond imagination. The origin of the technical trade term 'Orient' for pearls having superior lustre and overlay of colours under light, is attributed to Indian pearls. The high value of the Indian pearls made the then British Government to appoint a Superintendent of Pearl Fisheries in the Madras Presidency and the Moti Kata department in the Kingdom of Kathiawar. Certainly the most distinguished of the Superintendents was the renowned biologist, Late James Hornell. His reports and

records speak of pearl fisheries in the Gulf of Mannar that date back to the 1663. As early as in 1864, Prof. Thomas Huxley was presented with the problem of frequent and sudden depletion of pearl oyster beds in the Gulf of Mannar, and he suggested the possibility of culturing these pearl oysters. He also suggested the creation of pearl oyster parks to conserve the resources. The late Mr. Hornell also professed to have produced 6 forced free pearls in *Margaritifera vulgaris* (= *Pinctada fucata*) in the year 1908. He stated that the only deficiency in these cultured pearls were their size, which was small in comparison to naturally fished ones. Indeed, we must even think of placing Mr. Hornell alongside Saville-Kent, Mise and Nishikawa and Mikimoto.

The natural fisheries for pearls from southeast coast of India dwindled at an astonishing pace and by 1963 it was declared as closed. The collections from Gulf of Kutch also ebbed out in 1966.

India has a wealth of marine pearl producing oysters: the *Pinctada fucata* distributed in the Gulf of Mannar, Palk Bay and Gulf of Kutch and the blacklip pearl oyster, *P. margaritifera* in the Andaman and Nicobar Islands. The technology for pearl production, based principally on the Japanese methodology of pearl production, was tried and developed successfully in the Indian pearl oysters mainly through the efforts of Dr. K. Alagarswami of the CMFRI. Earlier Devanesan and Chidambaram of the Madras Fisheries department had also made several pioneering efforts with limited success. Dr. Alagarswami along with a dedicated band of young scientists, viz., Drs. Victor, Chellam, Dharmaraj, Velayudhan and Gandhi succeeded in the late seventies in developing a complete and fool-proof technology for the production cultured pearls in the Indian pearl oyster *P. fucata*. This breakthrough was achieved under the stewardship of Dr. Qasim, who was awarded the prestigious national honour of Padma Shri for this accomplishment. A well directed research programme on pearl culture was organised by the CMFRI in collaboration with the Government of Tamil Nadu as an *ad-hoc* scheme on pearl culture under the ICAR, from 1973 to 1978. During this period multiple production of cultured pearl was achieved and surgical equipments for nucleus implantation were also developed indigenously. This led to the establishment of a pearl farm at Krusadai Island by the Govt. of Tamil Nadu. Concurrently, pearl oyster spats were observed on mussel ropes hung in Vizhinjam Bay by Mr. G.P.K. Achary and Dr. Appukuttan. This enabled the institute to build a pearl oyster stock through farming and subsequently start trial production of cultured pearls. Following this, the Govt. of Kerala executed a pilot project on pearl culture in Vizhinjam Bay under the leadership of Mr. G.P.K. Achary.

The underwater surveys of the pearl banks carried out through SCUBA diving by M/s. Nagappan Nayar, Mahadevan and colleagues from CMFRI and Mr. Isaac Rajendran of the Tamil Nadu Fisheries Department helped delineate the pearl paars along the southeast coast. Their studies and reports also drew attention to the depletion of pearl oyster resources on these paars due to the settlement and mat formation over pearl oyster spats of exotic species of weaving mussels, *Modiolus* sp.

Though the technology of pearl oyster farming and pearl production were available indigenously, the natural beds of pearl oysters were 'barren' and there were apprehensions that the technology could not be put to use due to the dearth of pearl oysters. In this context, the CMFRI launched another research project for the production of pearl oysters under hatchery conditions. This project made a breakthrough in 1981 by large-scale pearl oyster seed production, especially through the research efforts of Dr. Anuradha Krishnan. This

gave the answer to the critical predicament of paucity of resource for carrying out cultured pearl production. Thus, the CMFRI became the nucleus of pearl culture research and development in India.

Our history also speaks of the famed freshwater pearls from the rivers and lakes in Madhya Pradesh and Uttar Pradesh. The fascination of the Nizam of Hyderabad for pearls from every conceivable corner of the globe resulted in the development of pearl trade in the walled city of Hyderabad. Known as the city of pearls, the trade for freshwater pearls (mainly imported from China) is concentrated here. We have abundant resources of the pearl producing freshwater mussels distributed in most freshwater bodies of the country. In 1987, a team of scientists in CIFA led by Dr. Janaki Ram succeeded in producing free round pearls, rice pearls and mabe pearls in 3 species, viz., *Lamellidens marginalis*, *L. corrianus* and *Parreysia corrugata*. Basically three types of implantation methods have been developed, viz., gonadal implantation, mantle tissue implantation (both nucleated and non-nucleated) and mantle cavity insertion. A number of entrepreneurs in Orissa, West Bengal Andhra Pradesh and Maharashtra adopted this technology and our indigenous production of freshwater pearls and mabes has been considerably increased. The Chinese pearl mussel *Hyriopsis cumingii* was introduced into India during 1995 mainly because of its large size capable of producing large pearls. The species has been bred in captivity also.

With indigenous developments in pearl culture technology, the CMFRI and CIFA over the years have adopted an open policy of training. Possibly, this is the only centre that offers such training in pearl culture not only for Indian nationals but also to foreign technicians who are sponsored through their governments. Dr. Richard Fassler, a world authority in pearl culture, remarked that while all countries are secretive regarding their pearl culture technology, India is the only country, which has an open training programme. In consonance with the policy of transfer of technology of the Indian Council of Agricultural Research, the Institute developed training courses in the areas of (1) technology of pearl culture, and (2) technology of hatchery production, and has implemented such training programmes since 1976.

The impact of training programme was positive and some maritime states initiated their own projects on pearl culture. Along the Tamil Nadu coast, M/s Tamil Nadu Fisheries Development Corporation Ltd (TNFDC) and M/s Southern Petrochemicals Industries Corporation Ltd (SPIC) took up a joint commercial project on pearl production in 1983 with technical know-how from CMFRI under the leadership of Mr. Jeyabasker of the Tamil Nadu state fisheries department. This was a laudable pioneering effort by the government and the industry. The technical problems faced when the technology was commercialised were duly solved. The Department of Fisheries, Gujarat started a research and development programme along the Gujarat coast with the natural pearl oyster resource. Later, to enhance the depleted stock, pearl oyster spat were also supplied from the shellfish hatchery of CMFRI at Tuticorin. However, commercial ventures by industrial houses were restricted to the areas around the natural pearl oyster beds in India.

The need to develop pearl culture as a rural upliftment programme was recognised only in the early nineties. One of the successful programmes involving fishermen was carried out at Valinokkam, a small coastal village of Tamil Nadu in southeast coast of India. In 1997, ICAR provided Rs. 30 lakhs to CMFRI to demonstrate the profitability of pearl culture ventures to the industry. This activity is successfully going on at Mandapam regional centre

of CMFRI and income worth Rs.10 lakhs has already been realized. I am happy to note that the pearls produced in this project are offered for sale in the exposition being organised upstairs. Besides, pearl oyster spat are regularly supplied to the industry on cost basis from this project. Borrowing on the success of the Valinokkam Bay experiment, the M.S. Swaminathan Foundation has also embarked on an ambitious rural programme in the coastal villages bordering Gulf of Mannar with the technical support of the CMFRI.

Recognizing the inherent merits and prospects of pearl culture, the Department of Biotechnology of the GOI, came forward to fund a research programme on tissue culture of nacre secreting cells of *P. fucata* and *L. marginalis* for production of pearls in in-vitro conditions. The projects have made many in roads into the basics of invertebrate tissue culture and I am glad to see that some of the results are being presented in this congress. The CIFA has also been able to establish a national centre for freshwater pearl culture under the DBT programme. The Department of Ocean Development (DOD) and ICAR also supported new programmes in on-shore pearl farming, a new concept, which is being standardised at the Visakhapatnam centre of CMFRI. In 1999, the National Agricultural Technology Programme (NATP) of ICAR provided funds to CMFRI to lead an ambitious programme to refine the marine pearl culture technology. This multi-pronged programme aims to initiate *Fucata* pearl production in the state of Gujarat, initiate black pearl production in A&N island, improve the percentage pearl production during the post-surgery phase, make-up or coloured pearl production, production of indigenous shell nucleus, improving farm structures and on-farm spat collection. I am delighted to see that some of the interim results emanating from the project are being presented here. I am also more than pleased to note that the project has been able to achieve large pearl (above 6 mm) and Mabe pearl production in *P. fucata* from the southwest coast. The project has also been able to carry out trial production of shell bead nucleus from locally available shells through the development of indigenous machines at CIFT owing to the efforts of Dr. Joshi.

To conclude, I would like to draw your kind attention to the following.

1. One of the researchable issues in pearl culture, which need immediate attention, is that relating to the quality and size of the pearls. Every one of us knows the superior value of large pearls. It is time to carry out genetic selection experiments so that oysters with larger depth, faster growth and good quality nacre are selected for propagation.
2. It is a matter of concern to me that valuable oysters are sacrificed at the time of harvest. It is imperative that we go for reimplantation experiments and develop the appropriate skills.
3. More thinking should go into the manner in which we do pearl farming operations now. Considering the long gestation period as compared to shrimp farming, it may be appropriate if we split the technology into various sub-components like spat production, mother oyster rearing, surgical implanting and post-surgery rearing. Each of these activities can be undertaken by different groups of entrepreneurs. This would also result in the development of separate ancillary industries based on pearl farming implements and supplies.
4. Colour manipulation (chemically or environmentally) in pearls is another area in which more attention has to be paid. Indeed, the initial results obtained at Tuticorin are very encouraging.

5. Production of rainbow pearls from Indian species of abalones, production of fine quality Mabe in *P. fucata*; *P. margaritifera* and *L. marginalis* are all topics that need specific focus.
6. We do not have a pearl shell ancillary industry to speak of. The magic that can be worked with the mother of pearl on ornaments and curios by artisans in Southeast Asia has to be seen to be believed. Value added nacre coated ornaments and designer jewellery are areas which need immediate attention. An appropriate interaction with the handicrafts departments has to be pursued to initiate this activity.
7. In another 2-3 years, with the funding support expected from the DOD, I believe that India will have the technology to produce black pearls in the A&N islands. Already, the infrastructure is in place, it only needs the proper human skill inputs to get the appropriate results.
8. Production of shell bead nucleus with high quality finish from indigenous shells and reconstituted powder are areas where business and trade possibilities exist. The success in exports to Australia and Tahiti which the Uttar Pradesh based Mr. Ajai Sonkar has had with his indigenous nucleus is indeed heartening.
9. The queen of pearls, i.e., pearls produced by the giant pearl oyster *P. maxima* is only next in price to the black pearls. Myanmar (Burma) is one of the leading producers of maxima pearls. And with Myanmar, we share a common sea (Andaman Sea along the north east Andaman) and it is very likely that the species exists in Indian waters also. Concerted efforts have to be made to survey the area and locate *P. maxima* beds, so that large silver and white pearl production can be initiated.
10. Even a century after Prof. Huxley's recommendation on creation of pearl parks, we are yet to do anything about it. I request the state government officials who are here to give serious thought to such parks or zones and make appropriate legislations such that farming structures in the open sea are not disturbed and are accorded adequate protection by the state. Without such a protection I don't see how new entrepreneurs will risk taking up such a challenging venture.

One has only to glance at the global pearl trade statistics to see that we have a long way to go if we are to make an impact in the global trade. In the year 2000, the global export trade was valued at US\$ 479 million in which Tahiti, Australia, Indonesia and Japan were the major players. On the other hand, we are now one of the major importers of pearls (worth US\$ 4 million annually). This trade imbalance needs to be corrected at the earliest. The only option for us is to produce fine cultured pearls, which can compete in international markets and thereby increase our exports. Clearly, the mandate to undertake this task does not rest with one agency, but with all concerned agencies with proper division of labour. I trust that the presentations and deliberations made here will properly take these into account and proper and just solutions will be found.